**Syllabus for B.Sc. (Hons) Agriculture Year – I (Sem. I)**

**Subject Code:** 16AS0114

**Subject Short Name:** SEC. 1.1

**Subject Name:** Bio-fertilizer and Bio-pesticide Production

**Objective:**

- To understand the principles and methods of producing bio-fertilizers and bio pesticides.
- To learn techniques for mass production and formulation of beneficial microorganisms, bio fertilizers and bio pesticides.
- To explore the role and bio-fertilizers and bio pesticides in sustainable agriculture and soil health management.
- To develop skills to integrate bio-agents, bio-fertilizers and biopesticides into crop production systems for enhanced yield and reduced environmental impact.

**Credits Earned:** 2 Credits (0+2)

**Course Outcomes:** After completion of this course, Students will be able to

- Study the history, concept, quality control and application of biopesticides and bio-fertilizers, their importance, scope and potential.
- Develop ability to differentiate the characteristic features of various bio-fertilizers and bio pesticides.
- Interpret storage, shelf life, quality control and marketing and factors influencing the efficacy of bio-pesticides & bio-fertilizers.
- Evaluate mechanism of Production technology of bio-pesticides and bio-fertilizers.

| Teaching Scheme (Hours) | | | Credits | Theory Marks | | | Tutorial/ Practical Marks | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Practical | | ESE (E) | Mid Sem (M) | Progressive Assessment (PA) | Viva (V) | Term work (TW) | |
| 0 | 0 | 4 | 2 | 0 | 30 | 20 | 25 | 25 | 100 |

**Practical Content:**

| Unit | Topics | Contact Hours |
|---|---|---|
| 1 | Relevance of Biofertilizer in Agriculture. Types of Biofertilizers ((a) Nitrogen fixers, Cyanobacteria and Azolla; (b) P-solubilizers: PSB, PSF; (c) K-solubilizers; (d) Zn-solubilizers; (e) P-mobilizers: AM fungi; (f) Development of consortia) | **4** |
| 2 | Isolation and purification of *Azospirillum*, *Azotobacter*, *Rhizobium*, P-solubilizers and cyanobacteria | **4** |
| 3 | Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertilizers | **4** |
| 4 | Application technology for seeds, seedlings, tubers, sets etc. | **2** |
| 5 | FCO specifications and quality control of biofertilizers, Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers | **2** |
| 6 | Introduction about bio-pesticides/global scenario/advantages, disadvantages and mechanisms of action | **2** |
| 7 | Isolation and enumeration of fungal biocontrol agents from soil; Isolation and enumeration of bacterial biocontrol agents from soil; Purification of biocontrol agents | **4** |
| 8 | Mass production of *Trichoderma harzianum*; Characterization of fungal (*Trichoderma harzianum*) antagonistic organisms (Morphological); Studies on antagonistic ability of fungal biocontrol agents through dual plate technique | **6** |
| 9 | Mass production of *Pseudomonas fluorescens* and *Bacillus subtilis*; Characterization of bacterial (*Pseudomonas fluorescens* and *Bacillus subtilis*) antagonistic organisms (Morphological); Studies on antagonistic ability of bacterial biocontrol agents through dual plate technique; Field evaluation of biocontrol agents; Evaluation of biocontrol agents against diseases of vegetables under protected cultivation | **6** |
| 10 | Evaluation of plant extracts (neem, tulsi, pongamia, etc) and liquid organic manures (panchagavya, beejamruta, Jeevamruta) against plant diseases; Registration procedures for biocontrol agents; | **6** |
| | **Total** | **40** |

**Reference Books:**


- Biopesticides and Pest Management, Biopesticides and Pest Management, Dhaliwal, G. S. and Koul, O., Kalyani Publishers, 2007
- Recent Developments in Biocontrol of Plant Diseases, Recent Developments in Biocontrol of Plant Diseases, Mukerji, K. G., Tewari, J. P., Arora, D. K. and Saxena, G., Aditya Books, New Delhi, 1992
- Biological Control of Microbial Plant Pathogens, Biological Control of Microbial Plant Pathogens, Campbell, R., Cambridge Univ. Press, Cambridge, 1989
- The Nature and Practice of Biological Control of Plant Pathogens, The Nature and Practice of Biological Control of Plant Pathogens, Cook, R. J. and Baker, K. F., APS, St Paul, Minnesota, 1983


**Suggested Theory distribution:**

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

| Distribution of Theory for course delivery and evaluation | | | | | |
|---|---|---|---|---|---|
| Remember | Understand | Apply | Analyze | Evaluate | Create |
| 25% | 25% | 20% | 10% | 10% | 10% |

**Instructional Method:**

1. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by white board may also use any of tools such as demonstration, role play, quiz, brain storming, MOOCs etc.
2. The internal evaluation will be done on the basis of continuous evaluation of students in the class-rooms.
3. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory/ field.
4. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.